where the surface overwash has hidden the character of the substratum. The forest on the loess is dominated by *Quercus alba* and *Q. ruba*, while the adjacent sandy areas are covered by the more xerophytic *Q. velutina* and *Q. macrocarpa*.—GEO. D. FULLER.

Air chambers of Ricciaceae.—Miss HIRSH,[31] under the direction of Dr. E. J. DURAND, has examined a number of species of Riccia to determine the correctness of the statement of BARNES and LAND that the air chambers of Marchantiales arise invariably by the splitting of internal walls. She finds that in the Ricciaceae the statement is true only for *Riccia natans* and *Riccia fluitans*, and that in all other species which she examined the air chambers arise according to the method described by LEITGEB, and cites as proof three figures of *Riccia Frostii*. To critical students of the group these figures do not furnish conclusive evidence one way or the other, for they are made in such a manner that the relation to each other of the rows of the cells back of the growing point cannot be made out with any certainty. In *fig. 4* of *Riccia Frostii* the first air chambers can as easily be interpreted as having split from within the thallus and having just reached the surface, as that the cells have become papillate. In fact, the contour of the section drawn seems to show that all the filaments actually originated by splitting and intercalary growth. The same is true in a more marked degree of *fig. 5*, and less so of *fig. 6*. In the latter figure the arching of the superficial cells due to turgor is interpreted by Miss HIRSH as the beginning of the papillate outgrowths of LEITGEB. Such investigations should be preceded by a careful study of the development of the thallus from the growing point, and there should be a clear conception of the arrangement of the cells which result from this growing point. While the style of the drawings is admirable, the position of cells and cell walls shows that such study must have been neglected in this case.—W. J. G. LAND.

Light and germination.—KINZEL[32] has devised apparatus that answers all objections to his former methods, which indicated that light favored or was even necessary for the germination of various seeds. Both illuminated and darkened after-ripened seeds of *Veronica Anagallis* were kept in germinators at a constant temperature of 16°.7 C. Within a week 100 per cent of the illuminated cultures had germinated, while none of the darkened ones grew even after three months. He lists 63 species that germinate only in light, of which the following are examples: *Scheuchzeria palustris*, *Luzula albida*, *Thalictrum angustifolium*, *T. aquilegiifolium*, *Drosera rotundifolia*, *D. anglica*, *D. intermedia*, *Primula pubescens*, *P. spectabilis*, *Verbascum Thapsus*, *V. nigrum*, *Mimulus luteus*, *Veronica Anagallis*, and *Campanula rotundifolia*. He does not state whether high temperatures will dispose of the necessity of light, as is the case with various fern spores. It also

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[31] HIRSH, PAULINE E., The development of air chambers in the Ricciaceae. Bull. Torr. Bot. Club **37**:73–77. *figs. 6.* 1910.

[32] KINZEL, W., Lichtkeimung: Erläuterungen und Ergänzungen. Ber. Deutsch. Bot. Gesell. **27**:536–545. *pl. 19.* 1909.

appears that he used the very low temperature of 16°.7 C. He finds that some seeds germinate much better in darkness than in light, for example, *Leucojum vernum*, Asphodelus, *Anthericus ramosus*, *Paris Smilacina*, Polygonatum, and Veratrum. Phacelia and *Nemophila insignis* germinate very slowly and sparingly in white light, more rapidly and abundantly in darkness, and very quickly and completely in blue light. KINZEL finds the favorable action of the light is not due to the actinic rays, for in many cases the rays exerting least actinic power are most effective in bringing about germination.—WILLIAM CROCKER.

Heterotypic mitosis in Lilium.—In a paper on the prophase of the heterotypic mitosis in the embryo sac mother cell, MOTTIER[33] describes the effect of fixing fluids and traces the early development of the heterotypic spirem in the megaspore mother cell of *Lilium Martagon* and *L. candidum*. The following conclusions are reached: (1) Previous to synapsis a single nuclear thread is developed, which in many cases can be demonstrated clearly as a definite spirem with somewhat regular and uniform chromatin granules. (2) There is no union side by side of two distinct chromatin spirems before or during synapsis, which is regarded as a normal process, but the greater compactness of the balled-up mass may be due partly to the reagent. (3) The hollow spirem following synapsis is double, due to the longitudinal fission, which as a rule becomes completely obscured before the transverse segmentation. (4) The first mitosis, therefore, separates transversely the two members of the bivalent chromosome. (5) The heterotypic mitosis is thus a reduction division, and if one chromosome differs from another potentially or otherwise, it is also qualitative. (6) In the presynaptic phase, that the chromatin may appear as large clumps instead of smaller and uniform granules has been suggested as being due in part to the fixing fluids, the finer and more uniform granules being nearer the normal. The wide divergence of the halves of the chromatin thread appearing occasionally in the stage of the hollow spirem may also be due in part to the reagent.—SHIGÉO YAMANOUCHI.

Germination of zygotes of Spirogyra.—The germination of zygotes of *Spirogyra jugalis* Ktzg. has been studied by KARSTEN.[34] The germinating stage of the zygotes was obtained during November and December, and some of the cytological results are as follows: Two nuclei in the zygote are in close contact, the membranes between them staining faintly and evidently becoming dissolved. In the fusion nucleus two nucleoli derived from two gamete nuclei are seen for a time, but they finally fuse. The interior of the fusion nucleolus is vacuolized, but the outer portion remains and stains deeply. At the first division of the nucleus the synaptic stage is represented by a peculiar and irregular massing of the nucleolar membrane and a peculiar elongated condition of the nucleolus, which is now

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33 MOTTIER, DAVID M., On the prophases of the heterotypic mitosis in the embryo sac mother cell of Lilium. Annals of Botany **23**:343–353. *pl. 23*. 1909.

34 KARSTEN, G., Die Entwicklung der Zygoten von *Spirogyra jugalis* Ktzg. Flora **99**:1–11. *pl. 1*. 1908.